Maine Department of Transportation
Research Highlights
May 2001

FRP - Reinforced Wood Structures. The UMaine Advanced Engineering Wood Composites Center has been researching and perfecting the use of fiber reinforced polymer (FRP) - reinforced wood structures. FRP reinforced wood allows the use of Maine timber species in the transportation infrastructure because of the added strength. Shown here is the Town of Milbridge Municipal Pier which was constructed with a FRP - reinforced glulam wood structural slab. The project goals were to save construction time, reduce maintenance costs and protect and strengthen the wood. The reinforced slabs weigh only 1/3 as much as prestressed concrete yet have the same strength and stiffness. This project was partially funded through FHWA's Innovative Bridge Research & Construction Program and will be monitored over time for performance and durability. Other applications being demonstrated in the field include FRP-glulam beams with glulam bridge deck, FRP-glulam beams with integral concrete bridge deck, FRP splices for repair of timber pile bents, and FRP reinforced Oriented Strand Board panels for temporary bridge decks.

Soil Nail Walls in Maine. Two soil nail walls have been constructed and instrumented on Maine DOT projects. Conventional retaining walls in areas subject to heavy freezing are normally designed with a zone of non-frost susceptible backfill that exceeds anticipated frost penetration depth. Because backfill is not used in soil nailing, designers have little control over soil properties of the retained earth. A soil nail wall along Rt. 201 in Moscow, Maine retains frost susceptible glacial till, and was designed with 10cm of facial polystyrene insulation in hopes of limiting frost penetration and ensuing heave. UMaine instrumented four areas of the Moscow wall and monitored for nail stresses, wall stresses, wall rotations, retained earth movements, the presence of water, and ground temperatures. Data analysis shows that insulation plays a large role in minimizing frost loads on nail and wall components. It was felt the insulation limited frost penetration to the upper levels of wall. Maximum nail head tension occurs as a result of frost action. In fact, a portion (5% to 74%) of the maximum frost induced nail stress is permanent and cumulative. Further analysis determined that the Moscow wall could have been more economically insulated by using 5cm (half the thickness used) of insulation placed at the face and at the wall top. A report on the first and second winter performance has been completed. Another report will be prepared that includes the third winter.

Evaluation of Vehicle Actuated Warning Signs. Collisions at intersections are one of the most common types of vehicle crashes in Maine. Many of these locations are blind intersections. Installation of full signalization to address this problem cannot always be justified due to cost, maintenance concerns and traffic delays on the major through highway. The objective of this project is to test and evaluate vehicle-actuated warning signs to reduce the incidence of collisions at selected intersections having severely limited sight distances. A vehicle actuated system was installed at a rural intersection along Rt. 201A in Norridgewock, Maine. The goal is to warn approaching traffic when a vehicle is about to enter the highway and also to warn an entering vehicle when an unseen vehicle is approaching from the blind approach. Before and after evaluations using Traffic Conflict Techniques are being performed. Preliminary results show that drivers are more cautious entering the highway. However congestion along the minor legs has increased.

Rational Mix Design Procedure for Full Depth Reclamation. Full depth reclamation is a recycling technique that shows great potential in saving material and costs, restoring proper roadway cross slope and grade and providing a crack resistant base course. However, the selection of stabilizing additive type and amount is based on experience and outdated practices. This study being conducted by Worcester Polytechnic Institute and Maine DOT will develop a rational mix design procedure and evaluate the performance of different additives. Preliminary results show the Superpave gyratory compactor can be used successfully in the mix design process. It is recommended that for selecting optimum additive contents to use total fluid content criteria versus density and resilient modulus. Also, addition of emulsion, lime or cement improves the durability of samples, compared to mixes with water only. Test sections along Rt. 201 in Caratunk, Maine are being monitored for performance. Material samples from other states will be tested to verify the proposed mix design procedure. An AASHTO Guide will be proposed.

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Reflective Cracking of Hot Mix Asphalt Overlays. Reflective cracking has long been a major problem associated with hot mix asphalt pavements. Several methods including milling, crack sealing, and fabric membranes have been used in an attempt to eliminate or delay the reflective cracking process. On a HMA overlay project along Rt. 1 in Caribou, Maine two commercially manufactured materials designed to minimize reflective cracking were evaluated, a stress relief interlayer consisting of geotextile fabric and high density mastic and a glass fiber reinforcement mesh. The evaluation was specifically centered around reducing the reflection of existing high severity transverse cracks. To date, one product is outperforming the control section. However, life cycle cost analysis estimates show no benefit to using these products for this particular application.

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